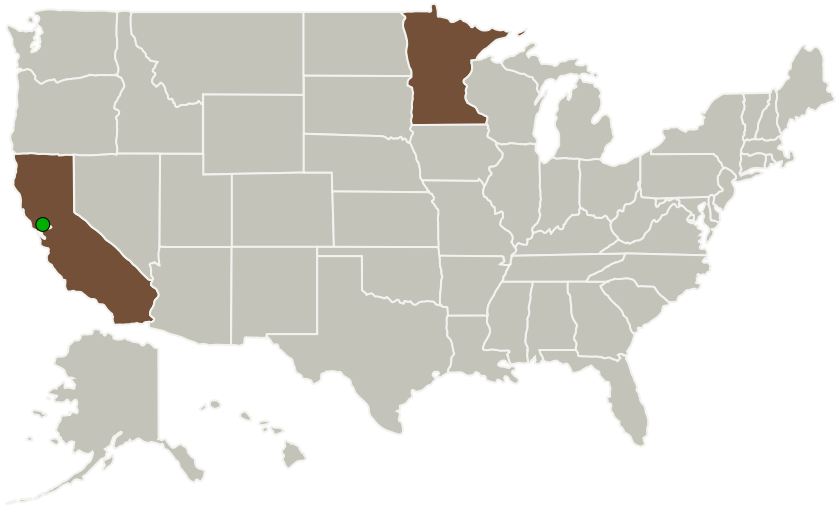
Robotics MobileRobot Navigation, Phase I

Completed Technology Project (2013 - 2014)

Project Introduction

Robots and rovers exploring planets need to autonomously navigate to specified locations. Advanced Scientific Concepts, Inc. (ASC) and the University of Minnesota will develop a navigational system that employs an IMU and a 3D FLASH Lidar camera manufactured at ASC. The system will furnish both the position of the rover and an elevation map of the terrain. The map will be useful in detecting hazards to navigation both by rovers and during entry, descent and landing (EDL). The algorithm is designed to function in real-time with the comparatively slow speed computers available in space by employing an advanced algorithm that makes efficient use of Lidar determined landmarks. Those landmarks that only appear in a few images are not retained in the state vector, but nevertheless furnish constraints on the rover's pose for improving its state estimates. Those landmarks that persist in many images are used for improving the accuracy of both the rover's state and the map at complexity only linear in the number of landmarks. Significant components of this approach have enjoyed success in NASA tests in the Mohave Desert for EDL and have been assessed at level TRL 4.

Primary U.S. Work Locations and Key Partners



Robotics_MobileRobot Navigation, Phase I

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Organizations Performing Work	Role	Type	Location
Advanced Scientific Concepts, Inc.	Lead Organization	Industry	Goleta, California
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California
University of Minnesota-Twin Cities	Supporting Organization	Academia	Minneapolis, Minnesota

Primary U.S. Work Locations	
California	Minnesota

Project Transitions

May 2013: Project Start

May 2014: Closed out

Closeout Summary: Robotics_MobileRobot Navigation, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image*(https://techport.nasa.gov/file/138467)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Advanced Scientific Concepts, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Brad Short

Co-Investigator:

Bradley Short

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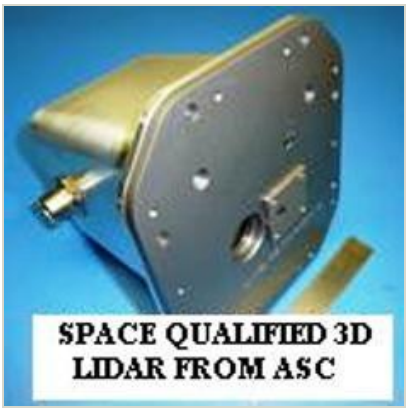
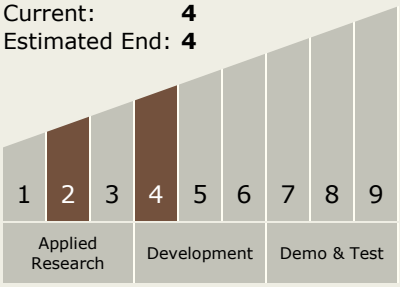
Images



Briefing Chart Image
Robotics_MobileRobot Navigation, Phase I
(https://techport.nasa.gov/image/137109)

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX04 Robotic Systems
  - TX04.2 Mobility
    - TX04.2.5 Robot Navigation and Path Planning

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System